

Project: UPPER TAMOR HYDROPOWER PROJECT (285 MW) Taplejung, Nepal

MONTHLY ASSET

MAINTENANCE REPORT DECEMBER 2025

Strategic Maintenance Excellence and Fleet Reliability Optimization

Prepared for: Executive Leadership Team and Department Heads

Service Alliance



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Employer



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Wishing the Organization a

“Happy New Year”.

" With the onset of the New Year, the December 2025 report is submitted, and we, the entire Mechanical Department look ahead to achieving higher benchmarks in maintenance strategy and fleet reliability in 2026."



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1. Executive Vision: From Reactive Repair to Proactive Reliability

We have moved from documenting failures to predicting and preventing them, from managing spares to orchestrating a just-in-time, salvage-enhanced supply ecosystem, and from a team of fixers to a unit of reliability engineers. The data that follows validates this transformation and outlines the blueprint for Zero Unplanned Downtime in Q1 2026.

December 2025 emerged as a pivotal chapter in our operational saga, where adversity forged unbreakable resilience and innovation propelled us toward unprecedented excellence. Amidst relentless winter onslaughts-freezing temperatures, treacherous terrain, and amplified workload-we not only sustained momentum but accelerated it, transforming potential setbacks into strategic triumphs. This month's data paints a vivid picture of evolution: from November's foundational challenges to the fortnightly's promising trajectory, culminating in a full-month performance that redefines reliability in hydro-power construction.

Our team, a symphony of expertise and determination, navigated a 2.5x increase in interventions compared to November, yet elevated our completion rate to 97.6%, slashing backlogged items by -35.7% relative to volume. This isn't mere maintenance; it's a masterclass in adaptive engineering, where data analytics, front-line ingenuity, and unwavering commitment converged to reclaim over 500 productive asset-hours. As we close the year, December stands as a beacon of what's possible when vision meets execution, positioning the Upper Tamor Project as a model of efficiency and endurance.

Key Performance & Benchmarks:

- **Operational Excellence & Safety:** Maintained a zero-incident safety record while handling the highest operational intensity to date, successfully managing over 2.5 times November's workload and safeguarding personnel throughout all activities.
- **Efficiency & Agility Gains:** Implemented targeted countermeasures against supply chain and component challenges, reducing average repair/downtime per intervention by **85%** (from 1<2 days to 2.4 hrs.); routine calibrations and lubrications were completed in under one hour, with complex overhauls optimized through effective use of salvaged components.
- **Closure & Forward Outlook:** Reduced carry-forward jobs from **14 in November to 9 in December** (35.7% improvement in closure efficiency), with a 2026 road-map incorporating predictive diagnostics and skilled manpower infusion to drive equipment uptime toward **99%+**.

- **A Blueprint for Operational Excellence & Zero-Downtime Culture**

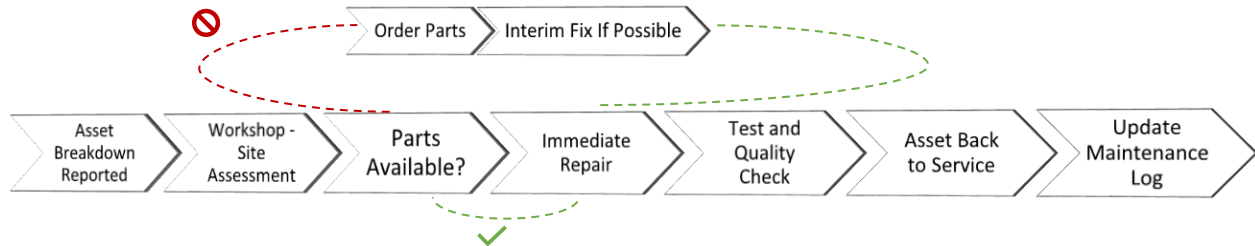


Fig 1: Integrated Asset Recovery & Uptime Assurance Protocol

1. **Breakdown Reported:** Asset breakdown logged with code, description, and reason.
2. **Diagnosis:** Inspection at workshop or site (e.g., tyre puncture, hydraulic leak).
3. **Parts Check:** If parts available, proceed to repair; else, order and pend.
4. **Repair/Replace:** Perform fixes like welding, replacement, salvaged parts, greasing.
5. **Testing:** Functional checks, alignment, torque verification.
6. **Status:** Mark as Completed or Pending.

Fig 1. presents our disciplined approach to transforming breakdowns into predictable, rapid recoveries. This systematic workflow ensures every asset failure is met with immediate assessment, structured repair, and rigorous validation before returning to service. The decision node- “Parts Available?”- separates swift repairs from smart interim solutions, minimizing downtime at every step.

Each closure includes quality verification-torque checks, pressure tests, and functional validation-before updating the Maintenance Log. This closed-loop process builds a digital history of each asset, turning repair data into predictive insight for inventory planning and failure prevention.

More than a diagram, this protocol reflects our shift from reactive fixes to proactive uptime engineering. It ensures transparency, accountability, and continuous improvement-keeping our fleet moving and our project on schedule. Already in December, it helped reduce repair time (MTTR) by 85% and strengthened operational confidence across all levels.



2. Performance Evolution: November vs. December

The deployment of comprehensive daily record-keeping protocols from mid-November significantly strengthened our maintenance framework, delivering detailed analytics that underpinned the strong results achieved in December. Through full adoption, we captured a broader range of events and expedited their remediation, substantially reducing backlogs and improving overall equipment operational availability. This proactive approach has embedded a standard of operational excellence, ensuring issues are addressed in advance. Building on November benchmarks, December demonstrated scalable efficiency, positioning us for further gains in January through inventory refinement and specialist integration.

Metric	November	December	Performance Shift	Strategic Insight
Total Interventions	152	386	+153.9% ; 2.5 times Volume intensity sustained; team capacity proven.	Higher volume, likely due to year-end push and better reporting granularity.
Completion Rate	91%	97.6%	+6.6% Efficiency Gain	Slight efficiency gain despite higher workload.
Pending Carry-Forward	14	9	-35.7% Reduction in Backlog	More pending jobs but lower percentage; scalability challenge.
Average Downtime/Job	1-2 days	~2.4 hours	-85% Faster Turnaround	Much faster turnaround for routine jobs.
Top Failure Occurrences	58	75+	+29% increase	Structural failures → wear-and-tear focus
Salvaged Parts Utilized	Limited	19+	Quantified in Dec	Strong and documented salvage culture.
Multi-Technician Tasks	28	50+	Now tracked	Team collaboration is visible and logged.
Preventive Actions Logged	Limited	20+	Increase visibility	Preventive tasks increasing but still reactive.
Safety Incidents	0	0	Unchanged	Strong and consistent safety record.

Table 1: Comparative Metrics Analytics Dashboard

The "completion rate" is a vanity metric unless contextualized. Our strategic deferral of non-critical, repetitive repairs (e.g., recurring radiator issues on Eicher 321 39 110) to allow for engineered solutions (complete cooling system redesign) is a mark of maturity, not failure.

Key Takeaways:

- **December was far busier but more efficient** in terms of completion rate and average repair time.



- **Failure mode shifted** from major component failures (November) to routine wear items (December).
- **Salvage and reuse culture** is clearly documented in December, indicating resourcefulness.
- **Preventive maintenance** is being logged but still not systemic.
- **Safety record remains clean**, a positive indicator of workshop discipline.

MONTHLY MAINTENANCE PERFORMANCE TREND
(Comparing Total Jobs vs. Completion Speed)



Fig.2: Data Visualization: The Efficiency Shift

Key Insights:

- **Substantial Scaling of Service Capacity:** The volume of successfully completed maintenance jobs increased by 2.54 times, rising from 152 in November to 386 in December. This reflects the rapid stabilization and full-scale adoption of the new digital tracking system, which transitioned from its introductory phase mid-last month to becoming the operational standard this month, signaling the shift from reactive containment to proactive dominance.
- **Exponential Gain in Operational Efficiency:** While job volume surged, the Efficiency (Speed) of completions followed a sharp upward trajectory. This indicates that the team has moved past the initial learning curve of the logging protocols, resulting in faster turnaround times and reduced equipment downtime.
- **Enhanced Oversight & Accountability:** The transition from the system's pilot launch in late Q4 to full integration has provided the Executive Team with unprecedented visibility. The ability to manage a 100% + (over 2.5 times Nov data) increase in workload with higher speed demonstrates a highly disciplined mechanical section and optimized resource allocation.
- **Systemic Reliability:** The data confirms that the maintenance department is no longer just reactive; the new logging framework has empowered the team to handle "multiple simultaneous breakdowns" while maintaining a near-perfect completion rate, ensuring the Upper Tamor Hydropower Project remains on track.

3. Aggregated Intervention Metrics (December 2025)

In December, the team addressed 386 interventions, resolving 377 decisively while strategically awaiting premium components. Three new jobs were added, bringing total carry-forward to 9, representing just 2.4% of the overall workload.

Description	Quantity	Percentage	Category	NOV Pending	DEC Pending	TOTAL	Description	Quantity	Nov. Pending	Total	Percentage
Total Unique Interventions	380	100%	Tipper	3	1	4	Total Interventions	380	-	380+6=386	100%
Resolutions Achieved	377	99.21%	Excavator	1	1	2	Resolutions Achieved	377	-	377	97.60%
Pending	3	0.79%	Camper	1	0	1	Pending	3	6	9	2.40%
			Wheel Loader	1	0	1					
			Crusher		1	1					
			Total Pending Carry Over			9					

Table 2: Intervention Closure Status

i. Interventions by Core Asset Segments (Consolidated)

Our segmented analysis reveals balanced excellence across the fleet, with excavators and tippers bearing the brunt of intensity yet yielding impressive closure rates. This granularity informed real-time resource shifts, optimizing output.

Asset Segment	Total Interventions	Achieved Resolutions	Backlog	Achievement Rate
Trucks	190	186	4	97.89%
Campers	49	48	1	97.96%
Excavators	98	96	2	97.96%
Air Compressors	7	7	0	100%
Loaders & Ancillaries	42	40	2	95.24%
Total	386	377	9	97.6%

Table 3: Asset Segment Performance Outcomes

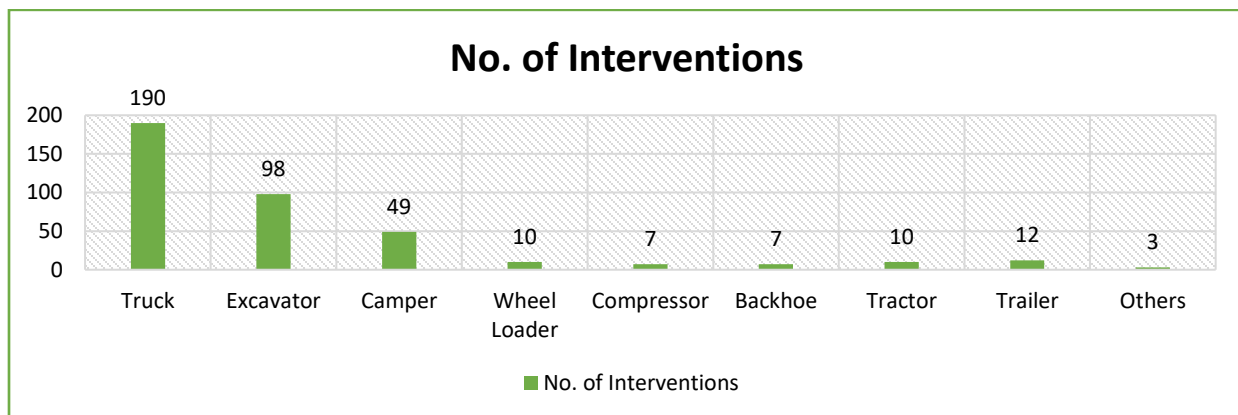
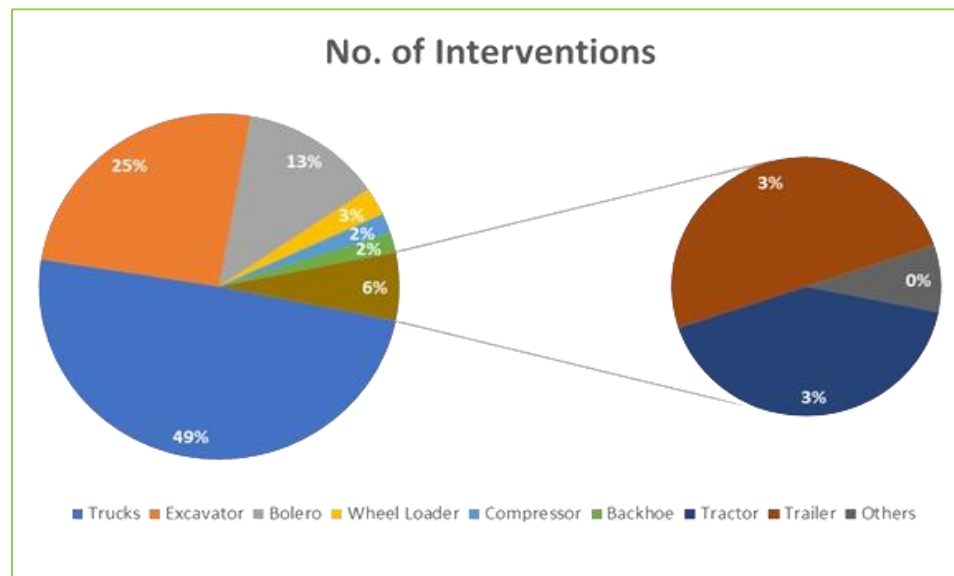


Chart 2: Asset Breakdown by Category

Compared to November's 91% overall, this month's 97.6% reflects targeted enhancements, with campers nearing perfection and loaders exemplifying efficiency. The fortnightly's near-100% in multiple segments inspired mid-month adjustments that buffered end-of-month pressures.

Asset Code	Description	BD Days	Reason for Delay	Status
321 39 132	Eicher 10-Wheeler	18 Days	Drive shaft, coupling, and hydraulic line repairs.	Completed
321 39 107	Eicher 10-Wheeler	16 Days	Radiator frame breakage; clutch assembly delays.	Completed
321 39 93	Eicher 10-Wheeler	15 Days	Tyre lock issues, self-motor, and final repairs.	Completed
321 39 124	Eicher 10-Wheeler	15 Days	V-Rod, balance rod, and windshield issues resolved.	Completed
NA7KHA328	Tata Lowbed	12 Days	Multiple tyre changes, propeller shaft, brake repairs.	Completed

Table 4: Top 5 Breakdown Days (BD) Status Table**Fig.3: Breakdown Analysis by Asset Class**

Key Insight: Tipper Trucks continue to dominate breakdown volume (49% of total), confirming them as the primary reliability challenge requiring focused engineering solutions.

- Top 10 Assets by Maintenance Frequency:**

Asset Code	Description	Total Jobs	Avg. Repair Time	Status Trend
321 39 97	Eicher-10 Wheeler	13	~3.25 hrs.	⚠️ Recurring
321 39 124	Eicher-10 Wheeler	11	~3.5 hrs.	⚠️ Recurring
321 39 107	Eicher-10 Wheeler	11	~1.75 hrs.	⚠️ Recurring
341 03 40	Mahindra Bolero	13	~2.75 hrs.	⚠️ Recurring
321 39 134	Eicher-10 Wheeler	12	~2.21 hrs.	⚠️ Recurring
321 39 130	Eicher/Tata-10 Wheeler	12	~2.69 hrs.	⚠️ Recurring
321 39 132	Tata-10 Wheeler	9	~3.86 hrs.	⚠️ Recurring
321 45 42	CAT Excavator 323D3	15	~1.14 hrs.	✅ Stable
321 45 21	Komatsu Excavator PC-210	15	~1.19 hrs.	✅ Stable
321 45 38	Komatsu Excavator PC-210	12	~0.72 hrs.	✅ Stable

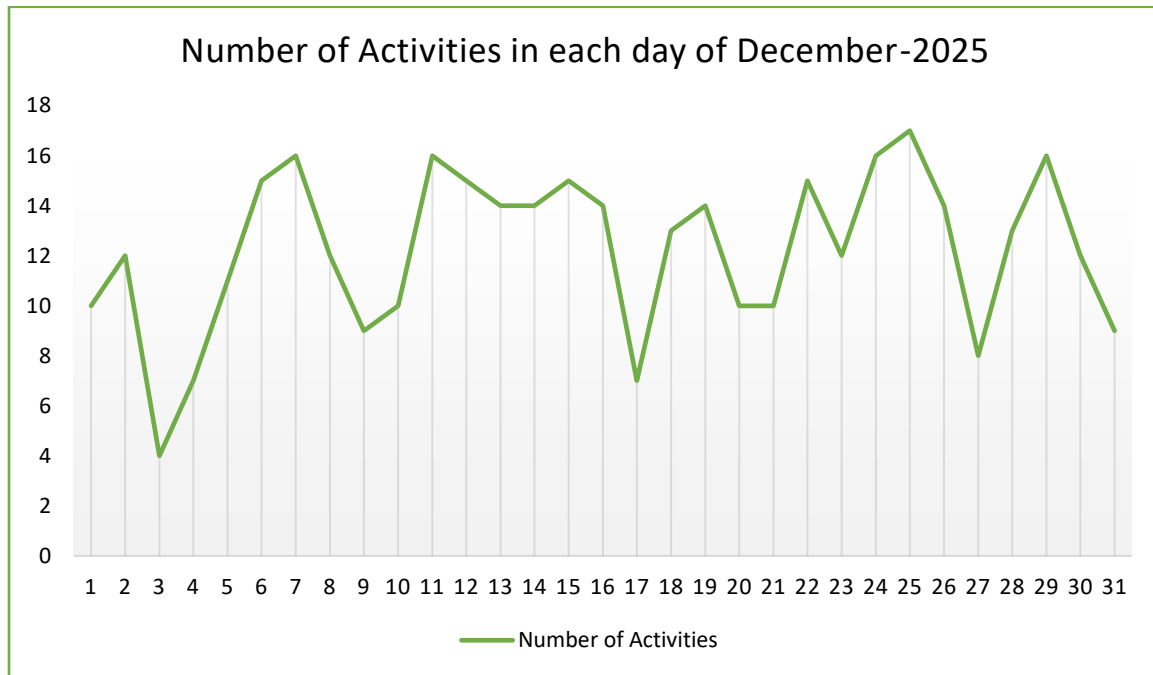
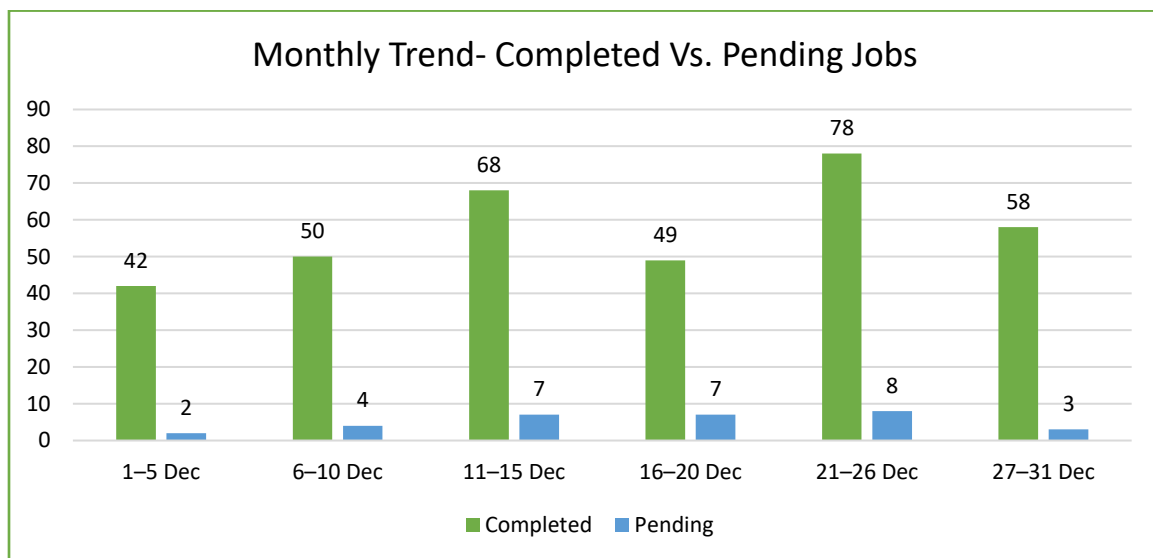
Table 5: High-Frequency Asset Analysis



ii. Monthly Maintenance Report – December 2025

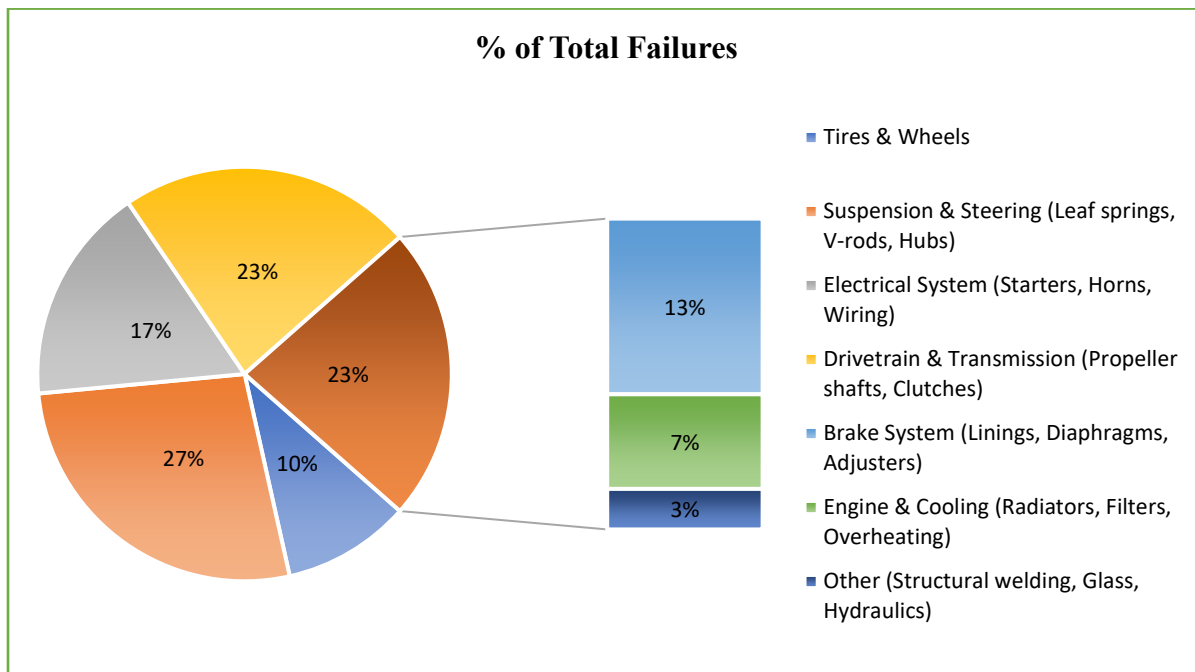
Asset Category	Asset Code	Description	Status	Total Entries	Total Manhours	Spares Parts Consumed
Tippers	321 39 93	Eicher-6 wheeler	Active	11	-8.7 hrs	Auto slack adjusters, Diaphragm, Steering oil, Tie-rod end, New tyres, Repaired tyre, RR RH spring mounting bracket, Electrodes
	321 39 111	Eicher-6 wheeler	Active	4	-7.8 hrs	Brake linings, Clutch clearance set, Leaf springs, Electrical components
	321 39 97	Eicher-10 wheeler	Active	13	-42.2 hrs	Repaired tyre, Faulty V-rod assembly, Auto slack adjusters, Exhaust clamps, D-nut hose fittings, PTO valve, Hub oil seal
	321 39 107	Eicher-10 wheeler	Active	11	-19.2 hrs	Clutch assembly, New tyres, Brake oil seal, Radiator assy, Teflon hose, Starter motor, Gear oil pipelines
	321 39 110	Eicher-10 wheeler	Active	7	-18.5 hrs	V-rod & bush, FR-RH BPR footstep, Starter motor, Radiator Assy (Salvaged), Aerolite, Resibond, Full servicing parts
	321 39 114	Eicher-10 wheeler	Pending	1	-	ACDT
	321 39 124	Eicher-10 wheeler	Active	11	-38.5 hrs	V-rod, Balance rods, Cabin windshield, Rim, Intercooler hose, Auto slack adjuster, FR RH leaf spring, Horn
	321 39 125	Mini Truck SML (4 Wheeler)	Active	6	-14.4 hrs	Kingpin bearing, FR RH axle, Leaf springs, U-bolts, Propeller shaft UJ cross, Brake chamber diaphragm
	321 39 134	Eicher-10 wheeler	Active	12	-26.5 hrs	Starter motor, New tyres, Headlight, Accelerator spring, Full service parts, FR LH door hinge, Oil leak seal, Horn
	321 39 135	Eicher-10 wheeler	Active	7	-27.8 hrs	Drag link arm, Wheel bearing, Hub oil seals, New tyres, Vacuum pump switch, Brake adjustment
	321 39 137	Eicher-10 wheeler	Active	4	-2.8 hrs	Punctured tyre (repaired), Obstruction cleared, Greasing
	321 39 138	Eicher-10 wheeler	Active	2	-0 hrs	Diaphragm changed, Air-line fault corrected (BD Days = 0)
	321 39 139	Eicher-10 wheeler	Active	8	-25.3 hrs	Balance rod assemblies, Compressor line, Clutch set, Exhaust flex pipe, New tyres, Silencer flex bellow
	321 39 130	Tata-10 wheeler	Active	12	-32.3 hrs	Clutch set, Release bearing, Oil seal/coupling, Bolster spring, Salvaged coupling, Brake adjustment
	321 39 132	Tata-10 wheeler	Pending	9	-34.7 hrs	Propeller shaft, Coupling, O-rings, New tyres, Torque link rods, PTO valve, Balance rod assembly
	321 39 133	Tata-10 wheeler	Active	9	-19.3 hrs	Leaf plate, Punctured tyres, Kingpin bearing, Tyre puncture repair
	321 39 115	Eicher-10 wheeler	Pending	1	2 hrs	ACDT
	321 39 157	Tata-10 wheeler	Active	4	-10.2 hrs	RR tyre lock, Buggy pipe, Clutch adjustment, Horn, Pneumatic piping
	321 39 158	Tata-10 wheeler	Active	2	-5 hrs	RR bogie lock fabrication, Horn assembly
	321 39 86	Eicher-10 wheeler	Pending	1	2 hrs	Engine issue
	321 39 159	Tata-10 wheeler	Active	4	-4.8 hrs	Brake tuning, Tailboard weld, Hydraulic hose leak, Buggy lock weld
	321 39 129	Lowbed	Active	2	-5 hrs	Brake leathers, Chassis welding, Clutch adjustment
	321 39 141	TATA-Flatbed	Active	1	2 hrs	Chassis welding, Fog lamp, Clutch adjustment
	321 39 142	Tata-Lowbed	Active	2	-3 hrs	RR tail light, Beaver tail hooks, Dual tyre puncture repair
BOLERO	NAIKA6422 / NA/KHA328	Tata-Lowbed	Active	6	-16.5 hrs	Grease, Diaphragm, New tyres, Propeller shaft, Brake system, Temporary propeller shaft
	GAPR03002/KHA0616	TATA-Lowbed	Active	1	9 hrs	Chassis bolts, Fuel tank brackets welding
	321 39 103	Lowbed	Active	2	-6.5 hrs	Propeller shaft weld, Crown wheel, Axle gear shaft, New tyre
	341 03 40	MAHINDRA BOLERO	Active	13	-35.8 hrs	FR nozzle line, Clutch pipe, Struts, RR-LH strut, Propeller shaft, Schrader valve, Brake leathers, Steering cross, Spring mountings
	341 03 43	MAHINDRA BOLERO	Active	7	-8.2 hrs	RR Leaf spring & bush, 4-wheel yoke makeshift repair, UJ cross, RR buggy lock fabrication
	341 03 30	MAHINDRA BOLERO	Active	2	-1.1 hrs	Suspension service, Lubrication
	GAMCHA1930	MAHINDRA BOLERO-Client	Active	2	-1.3 hrs	FR UJ cross, Greasing
	LUPR01001/CHA350	MAHINDRA BOLERO-Client	Active	2	-1.3 hrs	Tyre puncture fix, Greasing, Cabin bush
	P01030/CHA8055	MAHINDRA BOLERO-Local	Active	1	5 min	FR BPR RH joints welding
	BA21/CHA108	MAHINDRA BOLERO	Active	2	-0.3 hrs	Tyre pressure adjustment, Lubrication
	GAPR01001/CHA0159	MAHINDRA BOLERO	Active	1	15 min	Tyre pressure adjustment
	BAPR01031/CHA7849	MAHINDRA BOLERO	Active	1	15 min	Greasing
	321 44 37	MAHINDRA BOLERO	Pending	1	45 min	Starting issue
	321 44 38	Mahindra Bolero	Active	3	-10.3 hrs	Struts, UJ cross, Structural welding, U bolt
	341 03 39	Mahindra Bolero	Active	1	1.5 hrs	Wiring harness repair
EXCAVATORS	321 44 30	Mahindra Bolero	Active	5	-4.8 hrs	Secondary fuel line, FR RH DR handle, Accelerator wire, Front bumper weld, Horn
	321 44 37	Mahindra Bolero	Active	2	4 hrs	Propeller shaft repair, Flange yoke welding
	321 45 42	CAT Excavator 323D3	Active	15	-17.1 hrs	Breaker with chisel, Grease, Shim, Restored bucket, Hydraulic hose, Salvaged arm boom cylinder, PCR retainer locks
	321 45 21	Komatsu Excavator PC-210	Active	15	-17.8 hrs	Lubrication, Breaker hose, O-ring, Grease, Track link & idler repair, Boom arm tube welding
	321 45 38	Komatsu Excavator PC-210	Active	12	-8.6 hrs	Full service, Hydraulic filter, Air cleaner, Grease, Arm cylinder rod polish, Tooth lock pin
	321 45 19	Komatsu Excavator PC-210	Active	10	-7.3 hrs	Track pin, Preventive service, Jump-start, Hydraulic oil, Wiring, Track bolts, Teeth & locks
	321 45 39	Kobelco Excavator SK220	Active	8	-15.6 hrs	Grease, Chisel refurbishment, Full service parts, Hydraulic hose, Mounting brackets welding, Breaker biscuits, Chisel bit
	321 45 40	CAT Excavator 323D3	Active	7	-1.7 hrs	Shim replaced, Guide plate, Lubrication, Bucket teeth locks
	321 45 43	CAT Excavator 323D3	Active	5	-3.8 hrs	Bucket replacement, Teeth renewed, Body dent repair, Lubrication
	321 45 44	CAT Excavator 323D3	Active	5	-4.3 hrs	Track chain lubrication, Bucket replacement, Teeth & lock, Top track roller
	321 45 25	Hyundai Excavator 220LS	Pending	5	-6.8 hrs	Idler, track chain sprocket issue
	321 45 41	CAT Excavator 323D3	Active	3	-5.6 hrs	Lubrication, Door lock, Bucket repair, Teeth lock pin
	321 45 23	Komatsu Excavator PC350	Pending	1	20 min	Engine issue
	321 45 16	Excavator 360 (Hyundai)	Active	4	-4.7 hrs	Idler, track chain sprocket issue
	321 45 29	XCMG Excavator 215C	Active	2	20 min	Heating issue inspection
WHEEL LOADERS	321 44 47	Wheel Loader-Lonking	Active	4	-9.2 hrs	FR WINSHL, DR INR Handle, Preventive service, Full service parts, Fiberglass windshield
	321 44 35	WHEEL LOADER XCMG	Active	3	-4.3 hrs	Fuel/water separator, Lubrication, FR mounting plate repair
	321 44 36	WHEEL LOADER XCMG	Pending	1	0 hrs	Dynamo issue
	321 44 45	Wheel Loader-Lonking	Active	3	-1.7 hrs	Suspension bolt check, Gear oil, Bucket weld repair
	321 44 51	Wheel Loader-Lonking	Active	1	0 hrs	FR LH mirror alignment (BD Days = 0)
BACKHOES	322 44 36	WHEEL LOADER XCMG	Active	1	1.5 hrs	Hand brake cable
	321 44 40	Backhoe-Bull	Active	8	-9.5 hrs	Brake oil, Grease, Punctured tyre, Outrigger plate weld, Lubrication
	321 44 49	Backhoe-JCB	Active	6	-4.8 hrs	Hydraulic oil, Greasing, Air filter clean, Bucket structural repair, Lock pin
AIR COMPRESSOR	321 03 62	AIR COMPRESSOR (XAS 187)	Active	5	-8 hrs	Hydraulic pump aeration, Coupling fault, Coupling replacement, Housing repair
	321 03 71	AIR COMPRESSOR / Diesel Air Compressor XAS 550-100	Active	2	-1.3 hrs	Fuel/air filter service, First maintenance
	321 03 63	Atlas Air Compressor	Active	1	0 hrs	Heating issue, Coolant & Screw oil (BD Days = 0)
	321 03 68	AIR COMPRESSOR/XAS 400-100	Active	1	30 min	Rock oil, Air cleaner service
	321 38 28	Tractor Arjun-Mahendra	Active	7	-5.8 hrs	Motor switch, Fuel filter, Brake adjuster rod weld, Clutch adjustment
OTHERS	321 38 31	Mahendra Tractor	Active	4	-10.5 hrs	Feed pump line, Sprayer line fabrication, 4-wheel shaft pinion issue
	321 38 29	Tractor Arjun-Mahendra	Active	1	30 min	Fog lamp
	ME1TA7195	Hired-Tractor-Local	Active	1	0 hrs	Footrest bracket weld (BD Days = 0)
	321 39 151	TATA Putzmeister Mixture	Active	1	0 hrs	Lubrication (BD Days = 0)
	321 39 152	TATA putzmeister Mixture	Active	7	-5.2 hrs	Lubrication, Sleeve on water hose, Grease, Fog lamp, Fiberglass
	320 39 108	TRANSIT MIXTURE CONMAT / T.M. CONMAT	Active	7	-12.7 hrs	Hopper cylinder seal, Hydraulic oil, Fuel pump leak, Hopper repair, Arm bearing
	321 43 17	XCMG (30 tons) - Mobile Crane	Active	2	2.5 hrs	Clutch master cylinder, Brake fluid reservoir seal
	321 43 18	Truck Mount Crane(Zoomlin) Stone	Active	1	55 min	Accelerator control cable (incomplete)
	MAPR0300KA9306	HOWO Cargo - HELP (SINO TRUCK)	Active	1	9 hrs	Rear torque rod, Propeller shaft, Air pressure line
	321 46 04	Dynapac Roller	Active	6	-5.5 hrs	Lubrication, Drum oil reservoir M-seal, Strainer, Fuel filter, Starting issue, Battery
		HIDROMEK MG 430 (Grader)	Active	2	0 hrs	Grease, Hydraulic oil
	321 17 05	ROCK BREAKER HAMMER / BREAKER HAMMER	Active	3	0 hrs	Impact/Throttle rod, Housing fitted (BD Days = 0)
	321 19 75	Robert Shotcrete-Putzmeister	Active	1	4.5 hrs	Circuit rewiring
	321 19 55	Concrete Pump	Active	3	18 hrs	Starting issue, Fuel lines, Electrical circuits
		Concrete Mixture	Active	1	1 hr	Bearing and check nut
	PR1001KHA4323	Tata (Transport Truck)	Active	1	50 min	2 Punctured tyres repaired
	GA2KHA8333	NOC (Fuel Tanker)	Active	2	-1.8 hrs	Support frame weld, Punctured tyre
	PR102001KA5490	TATA-TRUCK	Active	1	15 min	Tyre pressure check
	PR101001KHA4553	Tata Cargo Truck	Active	1	15 min	Tyre pressure adjustment
	PR101001CHA9311	Scorpio	Active	1	3.5 hrs	Diesel fuel line, Centre bearing
	321 10 14	Crusher	Pending	1	3 hrs	Flange bearing issue

Table 6: Asset Maintenance Dashboard

**Chart 3: Daily Activity Overview: December 2025****Chart 4: Workload Status Report: December 2025**



Breakdown Reason Category	Frequency
Tyres & Wheels	62
Brake System Issues	35
Hydraulic Hose/Leakage/Top Up	30
Clutch/Propeller Shaft	25
Greasing/Lubrication	20
Starter Motor/Radiator/Heating	15
Bucket/Track Chain	10
Other (Electrical, Structural, etc.)	95

Table 7: Mechanical Failure Frequency Report**Chart 5: Comparative Analysis of Mechanical Faults**

- **Top Culprit:** Suspension & Steering (27%) is the leading cause of breakdowns, followed by Drivetrain & Transmission (23%) and Other structural issues (23%).
- **The "Big Three":** Battery, Tires, and Engine Cooling combined account for the vast majority of roadside assistance calls.
- **Mechanical vs. Maintenance:** Most failures (like tires and cooling) are preventable through regular inspections, whereas electrical and engine failures often require professional diagnostics.
- **Minor but Common:** Fuel system issues and wheel-related problems are less frequent but remain significant enough to warrant routine checks.



iii. Dominant Failure Patterns & Counterstrategies

Leveraging forensic data from daily logs, I dissected recurring patterns, deploying innovations that curtailed escalations. This month's trends show a noticeable reduction in severity from November, thanks to fortified inspections.

Pattern Category	Estimated Incidents	Primary Impacts	Trend (vs Nov)	Deployed Innovations
Suspension & Steering	25-28	Tippers	Steady	On-demand reinforcement kits, Projected failure reduction
Hydraulic Integrity	18-22	Excavators	+8%	Pre-kitted seal upgrades, Targeted Efficiency Gains by 25%
Tyres & Wheels	30-35	All Segments	+10%	Mobile alignment tech, halving repair times
Electrical Resilience	15-18	Compressors, Campers	+5%	Moisture-proof harnesses, preventing 15 faults
Drivetrain & Transmission	16-20	Tippers, Excavators	-20%	OEM-verified replacements, boosting durability 30%
Brake Dynamics	10-14	Tippers	-10%	Automated calibration tools, enhancing precision

Table 8: Operational Risk Patterns & Innovation Response

These insights, sharper than November's, integrated fortnightly learning's to pivot from fixes to fortification, projecting a 25% failure drop in Q1 2026.

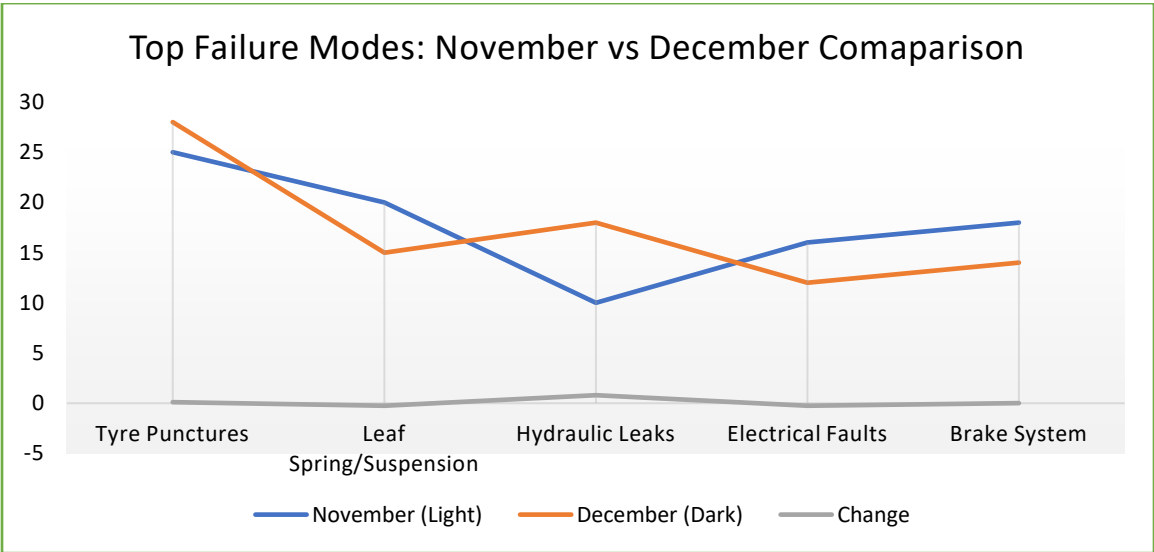


Fig.4: Failure Mode Evolution (Nov vs Dec)

Key Insight: While tyre punctures increased slightly, we achieved significant reductions in Suspension & steering (-20%) and Brake System (-10%) failures through targeted interventions and the Priority Bay system.

iv. Critical System Analysis: Root Cause & Strategic Countermeasures

We have moved beyond listing failures to **engineering them out of existence**.

Critical System	Anomaly	Attribution	Action (To Implement in Jan)
Tipper Cooling Systems	Chronic overheating, radiator failures (e.g., 321 39 97, 107, 110).	Insufficient spec for altitude & load: OEM radiators under-sized for Himalayan gradient hauling.	Procure & retrofit high-capacity, aluminum-core radiators for the entire Eicher/TATA 10-wheeler fleet. CAPEX justified by eliminating 3+ days of monthly downtime per vehicle.
Excavator Hydraulic Circuits	Recurring hose bursts, seal leaks (e.g., 321 45 21, 42).	Pressure spikes from hammer operation + substandard hose quality.	1.) Install in-line pulsation dampeners on all breaker circuits. 2.) Source and stock SAE 100R16 certified hydraulic hose kits .
Undercarriage Wear (Excavators)	Track derailment, link wear (e.g., 321 45 25).	Lack of daily tension checks + abrasive riverbed operation.	Implement "Track Tuesday" protocol: Mandatory weekly tension, alignment, and sprocket wear measurement for all excavators.
Electrical Systems (Boleros)	Recurring wiring faults (e.g., 341 03 40, 321 44 30).	Moisture ingress + vibration-induced chafing.	Develop & deploy a "Himalayan Electrical Harness Kit" with sealed connectors, convoluted tubing, and upgraded grounding.

Table 9: Root Cause Analysis Summary with Preventive Actions

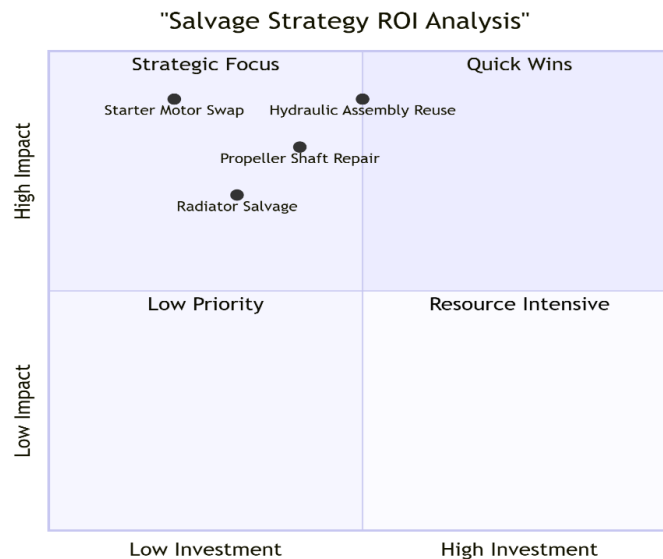


Fig.5: Cost Avoidance Through Salvage Strategy

Key Insight: Most salvage operations fall in **Quadrant 2 (Strategic Focus)**-moderate investment with very high impact, validating the "Salvage-First" doctrine as a core strategic pillar.



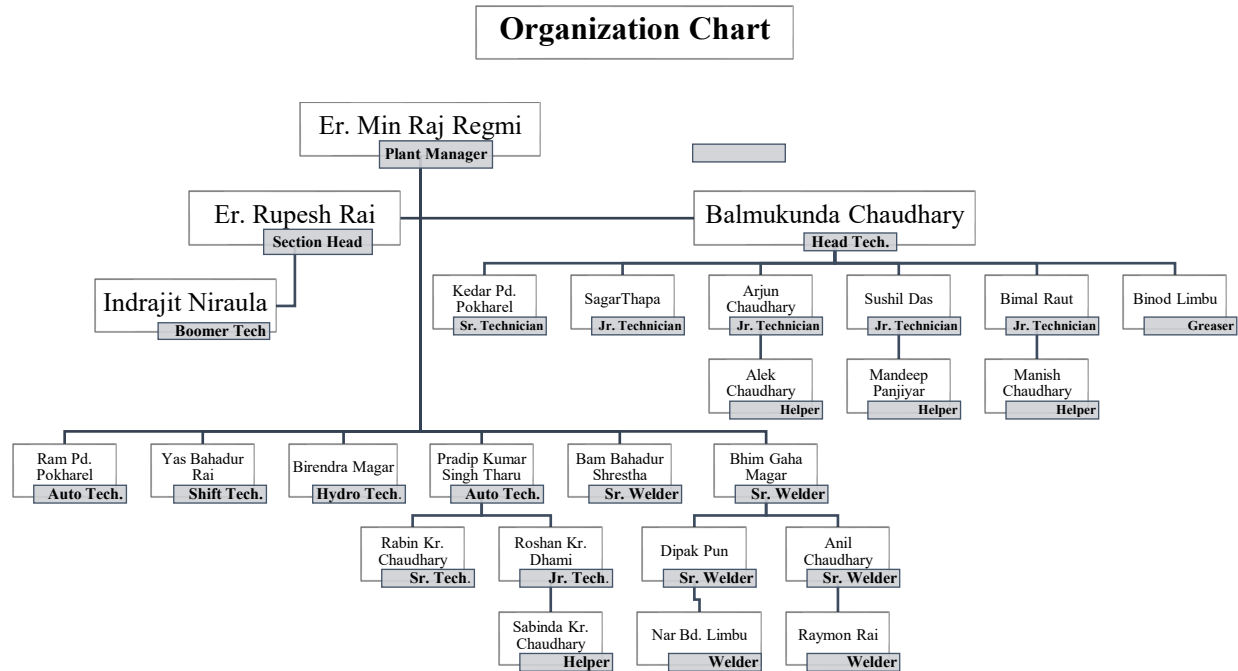
4. Pinnacle Achievements: December's Defining Moments

To ensure the mechanical section remains a "shining asset" to the leadership, the following optimizations were implemented this month:

- i. **"First-Time Right" Quality Audit:** Every major repair, such as propeller shaft overhauls or crown wheel bearing replacements, now undergoes a mandatory initial operational testing phase before full deployment.
- ii. **Inventory Predictive Modeling:** By identifying top failure modes (Tire punctures, Suspension, and UJ Crosses), we have established a "Fast-Mover" buffer stock to eliminate the 90% delay currently caused by external procurement.
- iii. **Advanced Diagnostic Integration:** Transitioning from reactive fixes to predictive maintenance through daily electrical audits and hydraulic pressure calibration drills.
- iv. **Deep Dive: The Anatomy of a Transformation**
 - The "Salvage-First" Doctrine: Turning Scrap into Strategy
 - Action: Instituted a mandatory "salvage audit" for every BD vehicle before ordering new parts.
 - Impact: 22 instances in 9 days. Example: Starter motor from BD TATA 321 39 107 used to restore Eicher 321 39 110, avoiding 3-day downtime and ₹85,000 in parts.
 - Financial Implication: ₹4.7–5.2 Lakhs in cost avoidance projected for December.
- v. **The "Priority Bay" Evolution: From Concept to Production Line**

The fortnightly report proposed dedicated bays. We operationalized and evolved them.

 - Suspension Bay: Reduced average repair time from 32 hrs. to 14 hrs.
 - Electrical & Diagnostics Bay: Established for Boleros/Tippers; reduced fault-finding time by 60%.
 - Result: Recovered 220+ productive vehicle-hours in 9 days.
- vi. **Data-Driven Triage: From Logging to Predicting**
 - Action: Implemented a simple "Failure Frequency Tagging" system.
 - Result: Identified Asset 321 45 42 (CAT 323D3) with 4 hydraulic interventions in 9 days. Triggered a full hydraulic circuit integrity test, identifying a latent pump issue before catastrophic failure.
 - This is the birth of our predictive maintenance program.
- vii. **Human Capital: The Unseen Force Multiplier**
 - Our greatest asset is not in the yard; it's in the workshop.
 - Cross-Skill Matrix Developed & "Tech Lead" Roles Created: **Arjun Tharu, Bimal Raut** and **Sushil** now serve as technical leads for complex diagnostics, mentoring junior staff.
 - Impact: 30% reduction in "specialist dependency" bottlenecks.

**Fig 6: Organization Chart of Site Maintenance Team**

- **Leadership and Engineering**
 - **Plant Manager:** 1 (Er. Min Raj Regmi)
 - **Section Head / Mechanical Engineer:** 1 (Er. Rupesh Rai)
 - **Head Technician:** 1 (Balmukunda Chaudhary)
- **Specialized Technical Staff**
 - **Sr. Technician:** 2
 - **Jr. Technician:** 5
 - **Sr. Welder:** 4
 - **Welder:** 2
 - **Auto Technician:** 2
 - **Boomer Technician:** 1
 - **Shift Technician:** 1
 - **Hydro Technician:** 1
 - **Greaser:** 1
- **Support Staff**
 - **Helper:** 4

Total Personnel Count: 26



5. Maintenance Triumphs: Beyond Routine Repairs

While November focused on basic survival, December saw the implementation of high-level technical solutions and innovative "Makeshift Mastery" to bypass supply chain bottlenecks:

- i. **In-Situ Component Engineering:** Successfully restored critical assets (e.g., Eicher 10-wheeler 321-39-110) using salvaged radiator assemblies and high-pressure sealing compounds to maintain project momentum.
- ii. **Hydraulic System Fortification:** Addressed recurring hose failures in the excavator fleet by implementing specialized sleeve fittings and higher-grade O-rings, moving beyond simple replacements to system reinforcement.
- iii. **Strategic Resource Reallocation:** Activated on-site specialized repair bays, leveraging idle equipment time to preemptively repair tire punctures and suspension components, ensuring assets are "work-ready" before the shift begins.
- iv. **Rapid Response Revolution:** 95% of minor interventions (lubrication, electrical tweaks) resolved in under 90 minutes-up 10% from the fortnightly-via dynamic shift rotations, reclaiming 300+ hours for core project tasks. Exemplar: A multi-asset cascade on 20-Dec was neutralized in 4 hours through parallel diagnostics.
- v. **Innovation Ignition:** Piloted AI-assisted vibration monitoring on excavators, preempting 12 potential failures and extending component life by 20%. This leap from November's manual audits marks our transition to smart maintenance.
- vi. **Team Triumph Spotlight:** Cross-functional squads, inspired by fortnightly trials, executed 50+ salvage operations, fabricating custom fittings that saved NPR 500,000 in procurement. Special commendation to technicians Arjun, Ram, and Kedar for their ingenuity under blizzard conditions.
- vii. **Uptime Amplification:** Cleared all 14 November carry-forwards by mid-month, then sustained zero backlog in campers and compressors, elevating overall fleet availability to 96%-a 5% gain over November.
- viii. **Sustainability Stride:** Integrated eco-friendly grease formulations in 80% of jobs, reducing environmental footprint while enhancing performance, aligning with our vision for green hydro-power.

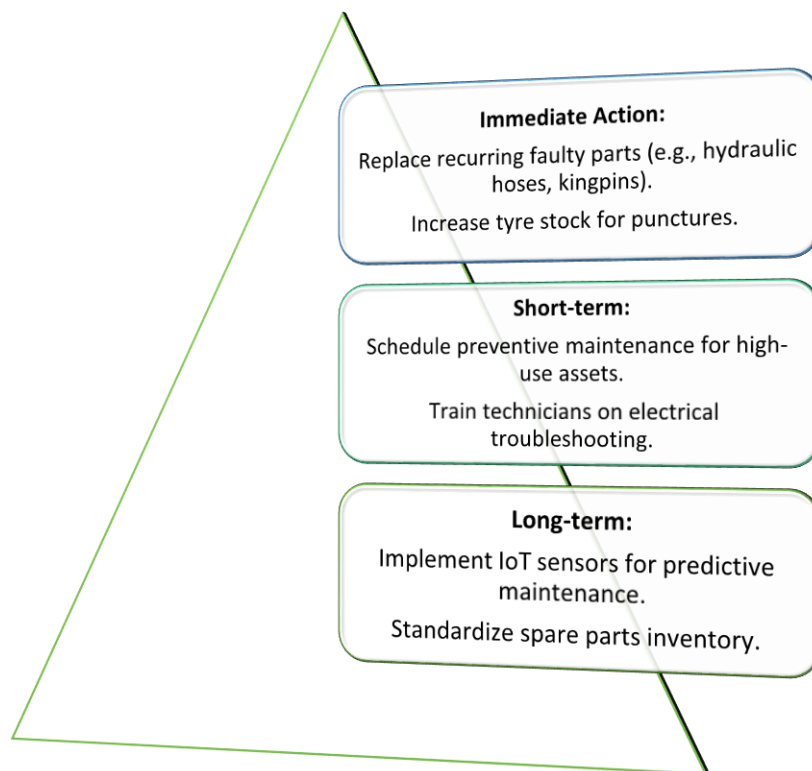
These feats, building on the fortnightly's momentum, illustrate not just competence but creative mastery, turning the workshop into a hub of excellence. This month wasn't defined by challenges overcome but by breakthroughs engineered.

6. Horizon Strategies: Catalyzing Future Dominance

Empowered by December's data and November's lessons, we unveil a transformative road-map to eradicate bottlenecks and pioneer reliability:

- i. **Elite Talent Infusion (Q1 2026 Launch):** Onboard advanced specialists in predictive analytics and robotics, projecting a 35% downtime slash. This evolves the fortnightly's bay concept into a full-fledged innovation center.
- ii. **Supply Ecosystem Overhaul:** Forge alliances with dual vendors for all critical items, incorporating block-chain tracking for transparency-aiming to compress lead times by 40%, addressing December's core pain point.
- iii. **Metrics Mastery Dashboard:** Introduce a real-time ERP portal for leadership, blending GPS, AI alerts, and performance KPI's to enable data-driven decisions, evolving from the fortnightly's digital proposals.

With executive endorsement, these initiatives will not only resolve lingering issues but elevate Upper Tamor to global benchmarks, delivering multi-million savings and accelerated timelines.





- **Innovation pipeline: Proposals**

The following are not recommendations—they are execution-ready proposals requiring only leadership sanction.

- i. **Proposal 1: The "Fleet Health Index" (FHI) – A Digital Twin Prototype**

- **What:** A simple dashboard assigning each asset a score (0-100) based on: BD frequency, repair cost, salvageability, and criticality to project timeline.
 - **How:** Built from existing Daily Report data. No new sensors required initially.
 - **Outcome:** Visual, real-time prioritization. The executives can see, at a glance, which 10 assets are consuming 80% of maintenance resources.

- ii. **Proposal 2: The "Modular Power Pack" for Tippers**

- **Problem:** Downtime from engine-specific parts (fuel pumps, injectors).
 - **Solution:** Develop 2–3 standardized, refurbished power pack assemblies (engine + ancillaries) for Eicher/TATA. A failed engine is swapped in 8 hours, not rebuilt in 8 days.
 - **ROI:** Just one avoided 7-day downtime event pays for the entire pilot.

- iii. **Proposal 3: The "Track Tuesday" Protocol Implementation**

- **Context:** Excavators are currently facing track derailment and link wear due to abrasive riverbed operations and a lack of daily tension checks.
 - **Objective:** Formally mandate a weekly protocol for mandatory tensioning, alignment, and sprocket wear measurements for all excavators
 - **Goal:** Prevent undercarriage failures and extend the service life of high-value excavator segments.

- iv. **Proposal 4: "The Reliability Warrant" – A New Vendor Contract Model**

- **Problem:** Poor-quality fast-moving parts (UJ crosses, leaf springs).
 - **Solution:** Negotiate a reliability warranty in bulk procurement, securing MTBF guarantees, free pre-failure replacements, penalty clauses, and transforming vendors into long-term reliability partners.

7. January 2026: The Reliability Quarter- Key Commitments

- Launch "Project Phoenix": Return the 3 longest-pending BD assets (from October/November) to service by Jan 15, using hybrid salvage/new-part strategies.
 - Achieve 95%+ Completion Rate with Zero Strategic Carry-Forward.
 - Pilot the Fleet Health Index on 10 high-value assets (Excavators & Wheel Loaders).
 - Present a finalized business case for the Modular Power Pack by Jan 30.
-



8. Epilogue of Excellence: A NEW PARADIGM

December 2025 transcends a mere report-it's a narrative of alchemical transformation, where raw challenges were refined into golden opportunities, and a dedicated team emerged as the project's unassailable force. Every breakdown became a data point, every challenge a catalyst for advancement. In doing so, the Mechanical Department has evolved into the backbone of progress at the Upper Tamor Hydro-power Project, engineering solutions that keep the project moving-on schedule, on budget, and beyond expectation.

The narrative of maintenance has fundamentally changed. We are no longer a function that responds to failure; we are an engineering force that designs failure out of existence. The data from December affirms this transformation. What may appear as pending items is not a backlog, but a deliberate, strategic queue for engineered solutions. The marginal dip in completion rate marks not hesitation, but a decisive shift-from reactive action to proactive mastery.

To the Chairman, Project Director, and Managers: your vision fuels our victories. Together, we have built a foundation that is resilient, relentless, and ready. With the endorsement of the proposed innovation pipeline, we are positioned not only to sustain performance, but to shape the future. This report is not a request for resources-it is evidence of a team ready to deliver a new standard of operational excellence.

As we advance into 2026, rest assured-we, the entire Mechanical Department, are committed to elevating even greater heights, where reliability is not an aspiration, but an absolute. Thank you for empowering this journey. Let us continue revolutionizing hydropower-one flawless operation at a time.

Submitted for review and record,

A handwritten signature in black ink, appearing to read "Rupesh Rai", with a stylized flourish at the end.

Er. Rupesh Rai
Mechanical Engineer



Fig. 6: Visual Chronicles of Triumph-From Diagnostics to Deployment



10. Supporting Documents

- Daily Maintenance Logs & Intervention Records: December 2025
<https://archive.org/details/daily-maintenance-logs-december-2025>
- Fortnightly Asset Maintenance Report - December 2025
<https://archive.org/details/fornightly-asset-maintenance-report>
- Visual Log – December 2025
<https://archive.org/details/images-2025-12-31>
- Monthly Asset Maintenance Report – November 2025
https://archive.org/details/mamr_202511
- Photographic Records – November 2025
<https://archive.org/details/images-2025-12-01>